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ABSTRACT

Because of its geographical location, topography, and climate, South Florida has unique water problems. When the rainfall situation is combined with changing land use patterns and increasing population growth rates, the result is often water shortages in some areas and floods in others. This study unit looks at some of the reasons for the present water problems in Florida and some of the consequences of a lack of understanding of water dynamics. The student is given the opportunity to investigate his/her own personal contribution to the water situation, and to consider options for helping to ensure an adequate water supply in the future. A field trip to a swamp is featured. The document includes an overview, objectives, information, maps and illustrations, and student activities. Appendices include a map, the 4Mat model, an application of this unit to the 4Mat model, a cognitive pre/posttest, a student book, a glossary, a discussion of scheduling considerations, and parent permission form. (CW)

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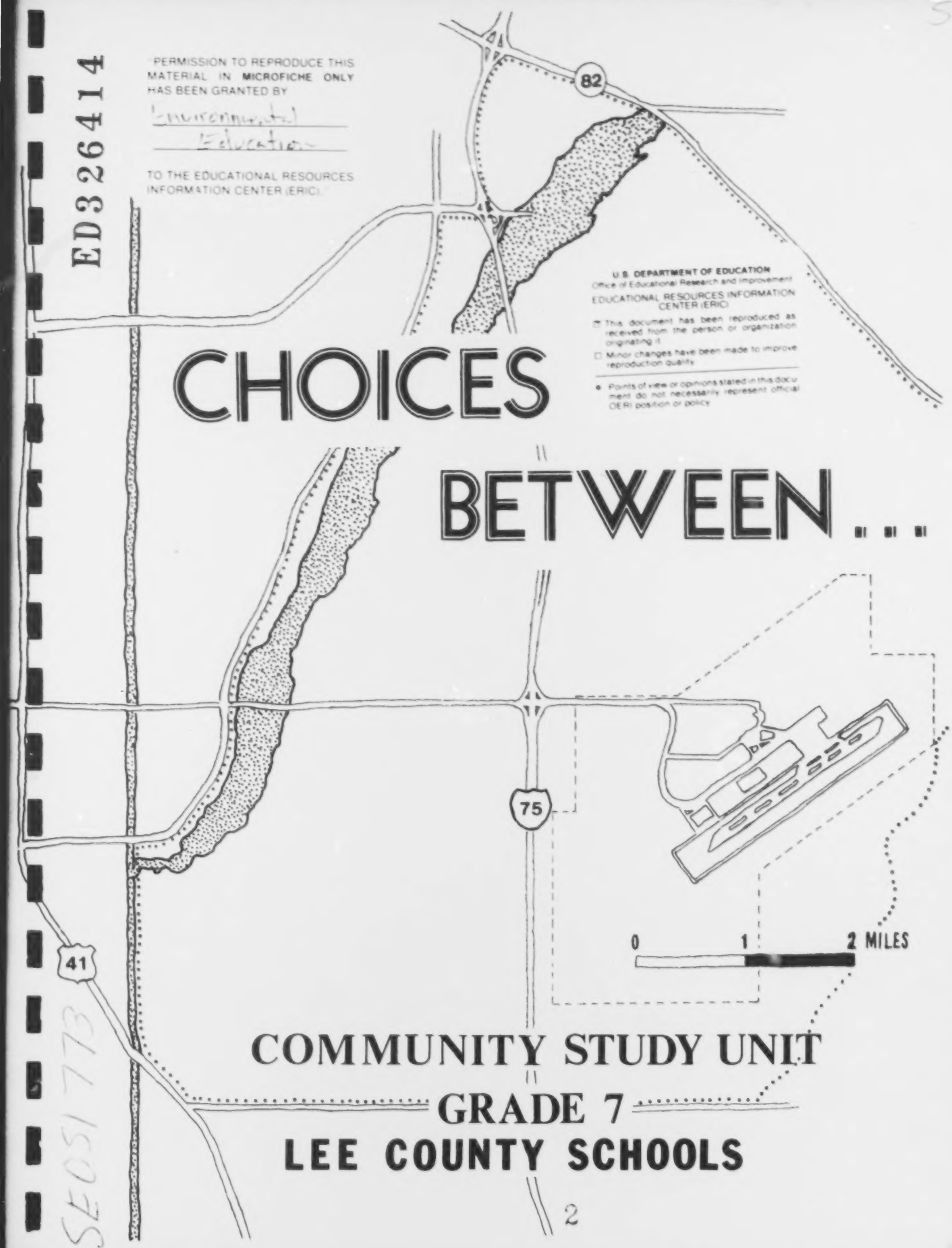

CHOICES BETWEEN...

COMMUNITY STUDY UNIT

GRADE 7

LEE COUNTY SCHOOLS

SE051773

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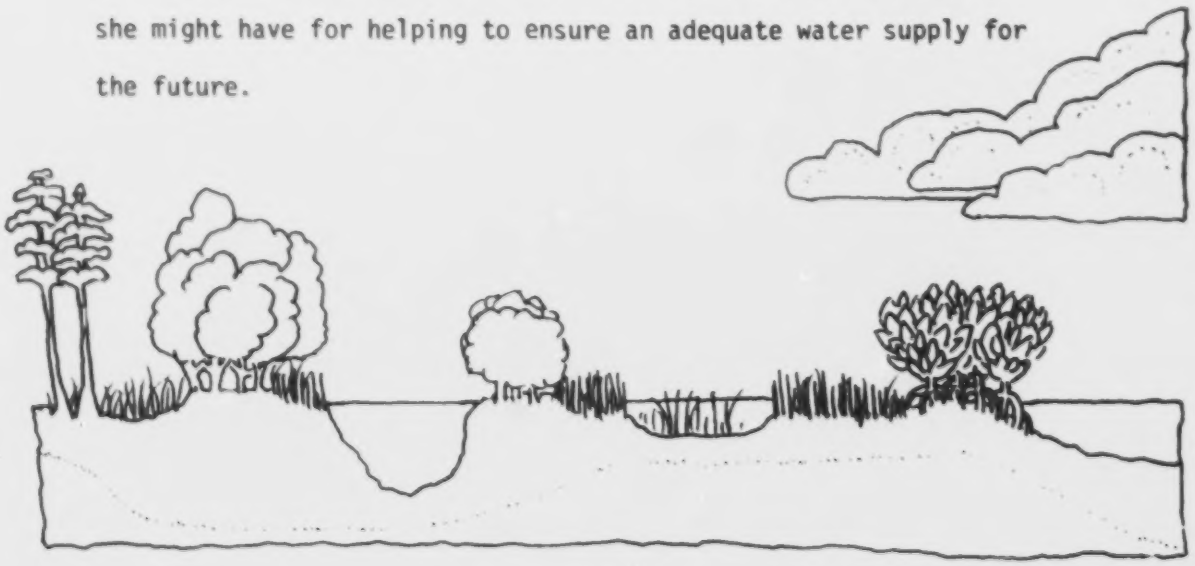
Overview

Because of its geographic location, topography, and climate, South Florida has unique water problems. Florida's seasonal rainfall has created "drought or drown" conditions in Florida for at least the past 100 years. When this condition is combined with changing land-use patterns and increasing population growth rates, the result is often water shortages in some areas and costly floods in others. As South Florida continues to grow, its citizens must face major water allocation decisions; potable drinking water for people, water for agriculture, water for estuaries and fisheries, water for industrial expansion. This study unit looks at some of the reasons for Florida's present water problems and some of the consequences of the lack of understanding of Florida's water dynamics. The student is given the opportunity to investigate his/her own personal contribution to the water situation, and to consider options he/she might have for helping to ensure an adequate water supply for the future.



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CONTINUUM CONNECTIONS

SCIENCE

7-5/F Demonstrate the use of process/skills such as measurement.

7-14/D Research and describe the various relationships between plants and their environment.

7-18/S Recognize the function of behavior patterns in the survival of plants.

7-25/S Explain the structures and functions of the body systems.

7-32/E Describe the factors influencing an ecosystem.

7-33/D Observe and describe the process of succession and the resultant climax community. Give examples of various organisms' habitats and niches within a community.

7-33/E Explain the relationship between transitional communities and boundary species.

7-34/S Gain an understanding of conservation and conservation practices.

7-34/F Through everyday observation, give examples of the use of natural resources and the need to conserve these resources.

7-35/S Understand how man's activities have changed the quality of the environment.

7-35/F Through daily observation and visual aids, recognize changes in the environment caused by man.

7-35/D Explain or illustrate the relationship between man's changes on the environment and their effects on plants, animals, and man.

7-35/E Develop alternate means to lessen some negative influences created by man's activities.

SOCIAL STUDIES

7WGEO-12/D Identify "commissioners" as the title given to the five people who govern Lee County.

7WGEO-28/F Define the following terms: climate
natural environment.

7WGEO-28/D Identify the major factors that influence climate patterns:
latitude
altitude
prevailing winds
shifting pressure centers
land and water divisions

7WGEO-28/E Describe some of the ways climate limits people's choices about how they live and meet their needs.

7WGEO-28/F Identify natural vegetation as the kind of plants that grows wild without the help of people.

CONCEPTS

1. Water is essential to all living things.
2. The climate and topography of South Florida combine to give this region a summer wet season and winter dry season.
3. Water is a limited resource for which there is an increasing demand.
4. Adequate water resources for the future require sound water management practices today.

OBJECTIVES

The student will be able to:

1. recognize that all living things need water;
2. recognize that South Florida has a climatic pattern of wet summers and dry winters;
3. recognize the problems which increasing demands place on a limited resource;
4. outline the choices we must face in determining water use in South Florida, and understand the consequences of these choices;
5. express personal feelings related to firsthand experiences in a swamp.

Introduction

This study unit is designed to give 7th grade students an opportunity to investigate the dynamics of the water system of southwest Florida and the problems that are associated with an increasing demand on this limited resource. There are four sections to the unit.

The first section is primarily an introduction to the subject; students are asked to list uses for water and to prioritize these uses in the face of a hypothetical water shortage. In an effort to get the students to begin to think of the water bodies of South Florida as complex, interrelated systems much like living organisms, they are asked to draw parallels between a swamp and themselves using metaphor.

In the second section of the unit, the teacher is called upon to supply the background information relating to water in general, and to water in South Florida in particular. The water cycle is discussed, as are the features of South Florida that led to the present condition of our water problems.

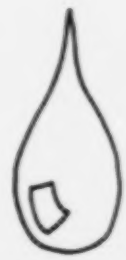
The students are divided into a number of "special interest groups," each group having particular needs and concerns for our water supply. The groups will research their particular concerns and begin to develop a strong rationale for their "special" viewpoint.

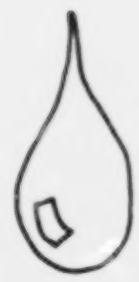
The third section of the unit is designed to give the students a chance to see for themselves a locally important water system, 6-Mile Cypress Swamp. Activities during the trip focus on the properties of the swamp that make it unique and valuable to the citizens of Lee County.

In the final section of the unit, the students are asked to report back to the class the needs of each of the special interest groups, in the form of a mock County Commission meeting. They begin to consider compromise situations and draw up some legislative guidelines designed to protect our present water supply from depletion or contamination in the future. The students are asked to consider what the consequences will be for their decisions.

A copy of the 4MAT System Model which has served as the organizational foundation for

this unit is included in the Appendix of the unit. Taking into account the latest information from learning styles research, this model allows the teacher to develop unit plans that will enable each student to particjpate to a greater extent in the learning experience. In the appendix the teacher will also find a 6 - Mile Cypress Watershed Basin map, a list of additional resources for the unit, a glossary of terms, and a note regarding scheduling the field experience with a leader from the Department of Environmental Education and Instructional Development Services.





THE WATERSONG

by Dale and Linda Crider

We have sown our seeds in a biosphere
where water is the flow
Soil and air arrange to form
the edge for life to grow.
Water drops to shape the sand
where life intends to root,
Beaches, banks and edges meet
and plants with animals group.

A natural flow for H_2O
is wilderness to some
Each species is renewable
on what essentially life comes from.
Floating on a river's stream
drifting thru a lake
Renewed in ways the rhythm waves
the tributaries take.

Drops of water tear the eye
that cries for lack of rain
Moisture builds in seasons skies
and swamplands flood again.
Wilderness is free for every
life that lends an ear
Listen to the water song
around the turning sphere.

Joy is water rippling thru
the patterns of the wind
Moon and sun combine to make
a life in perfect blend.

Dissolve, resolve, involve this life
which water's based upon,
The rhythmic waves and falling rain
are the essence of a watersong.

WATER IMAGES

- watching water go down the drain
- canoeing on a stream
- taking a hot shower
- taking a cold shower
- drinking a glass of water
- standing in the middle of a frozen lake at night
- hiking through a swamp
- sailing on a breezy day
- swimming in a backyard pool
- watering the lawn
- fishing in the surf
- lying on the beach
- standing in the pouring rain
- watching firemen at work
- having a water balloon fight
- being stranded at sea on a raft
- watching a thunderstorm
- riding your bike through a puddle
- changing a baby's diaper
- washing the car
- flushing the toilet
- snorkeling over a coral reef
- doing the laundry
- watching a storm on the beach
- walking the dog
- sliding down the Aqua Slide
- water skiing in the bay
- following the hurricane reports
- _____
- _____
- _____
- _____

A Reason for Learning

Section 1

The activities in this section should provide students with experiences that directly link the unit concepts with their personal life experiences. Students must also have a chance to discuss those connections with one another. In this initial phase of the unit students should discover a reason for learning the instructional concepts.

1. Give PRE-TEST to students (pages 49 - 52).

2. WATER IMAGES

   This introductory activity is designed to stimulate a variety of personal responses to "water" under various conditions. Have the students choose 10 or more of the water images on the previous page. As a homework assignment, have them respond with their personal feelings or emotions to each of the scenes. The responses can be in the form of visual images, collections of song lyrics, poems, etc. Share responses with the class.

3. "THE WATERSONG"

   Present the class with copies of *"The Watersong."* A cassette tape is available from the Department of Environmental Education and Instructional Development Services. You may choose to play the music for the class or have a student read the poem aloud as the class follows. The lyrics deal with several of the concepts of this unit, including the water cycle and the need for water by all living things. Have the students react to the poem in a manner in which they feel most comfortable. Using drawing, painting, sculpture, dance, skits, or discussion, interpret the meaning of the poem. What is a watersong?

List on the board any terms in the poem with which the students have difficulty (terms such as sown, biosphere, tributaries, essence). Discuss their meanings in the context of the poem.

4. WATER USES

Have the students list all the uses for water they can. Make suggestions if the students need prompting. When the list is completed, divide the class into small groups and have them prioritize these uses, considering the importance of each use. It may be helpful to suggest to the students that there is a possibility of a 50% reduction in water supplies this year. Which uses can be curtailed and which uses must be maintained?

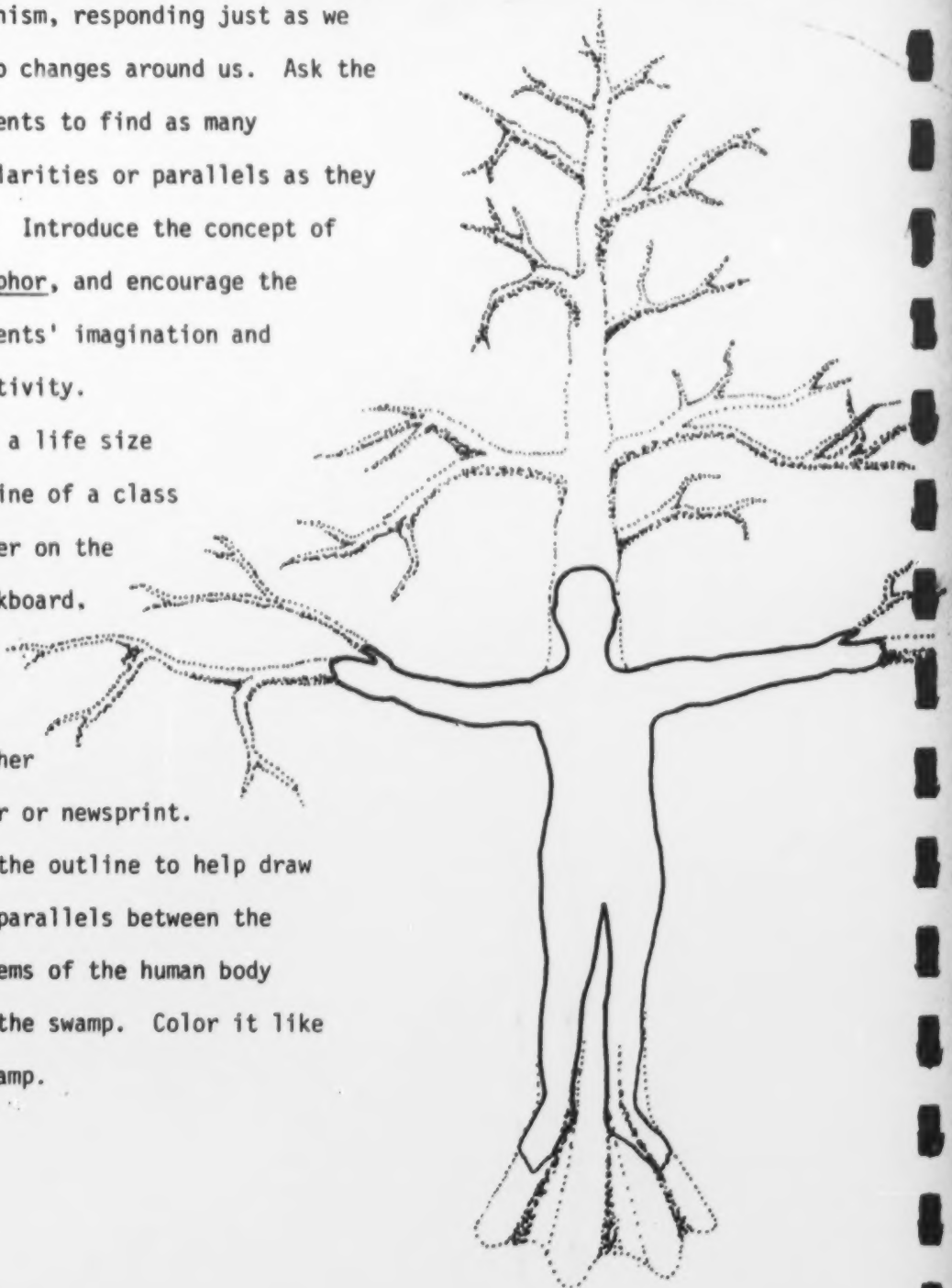
5. HOW ARE YOU LIKE A SWAMP?

Sound like a strange question? Well, in one sense it is. After all, we can plainly see that human beings and swamps are two distinctly different things. It would be a futile exercise to try to list all of the things that make the two different. But what about the similarities? With just a little stretch of the imagination we can parallel the human respiratory system with the plants and trees of the swamp. Both take in gases for respiration, use these gases in some manner, and then release another gas to the atmosphere. What about digestion? We take in food and excrete our wastes, and likewise, the swamp has a pattern of taking in materials, altering them in some form, and then passing them on. Where is the swamp's excretory system? Where is its brain, its nervous system, etc.?

-- Like us, the swamp has a life cycle. It is born, grows up, gets old, and may even die. Both the swamp and the human body are dependent upon other things in the environment for their survival.

-- In a sense, the swamp is a living organism, responding just as we do to changes around us. Ask the students to find as many similarities or parallels as they can. Introduce the concept of metaphor, and encourage the students' imagination and creativity.

6. Draw a life size outline of a class member on the chalkboard, or on butcher paper or newsprint. Use the outline to help draw the parallels between the systems of the human body and the swamp. Color it like a swamp.



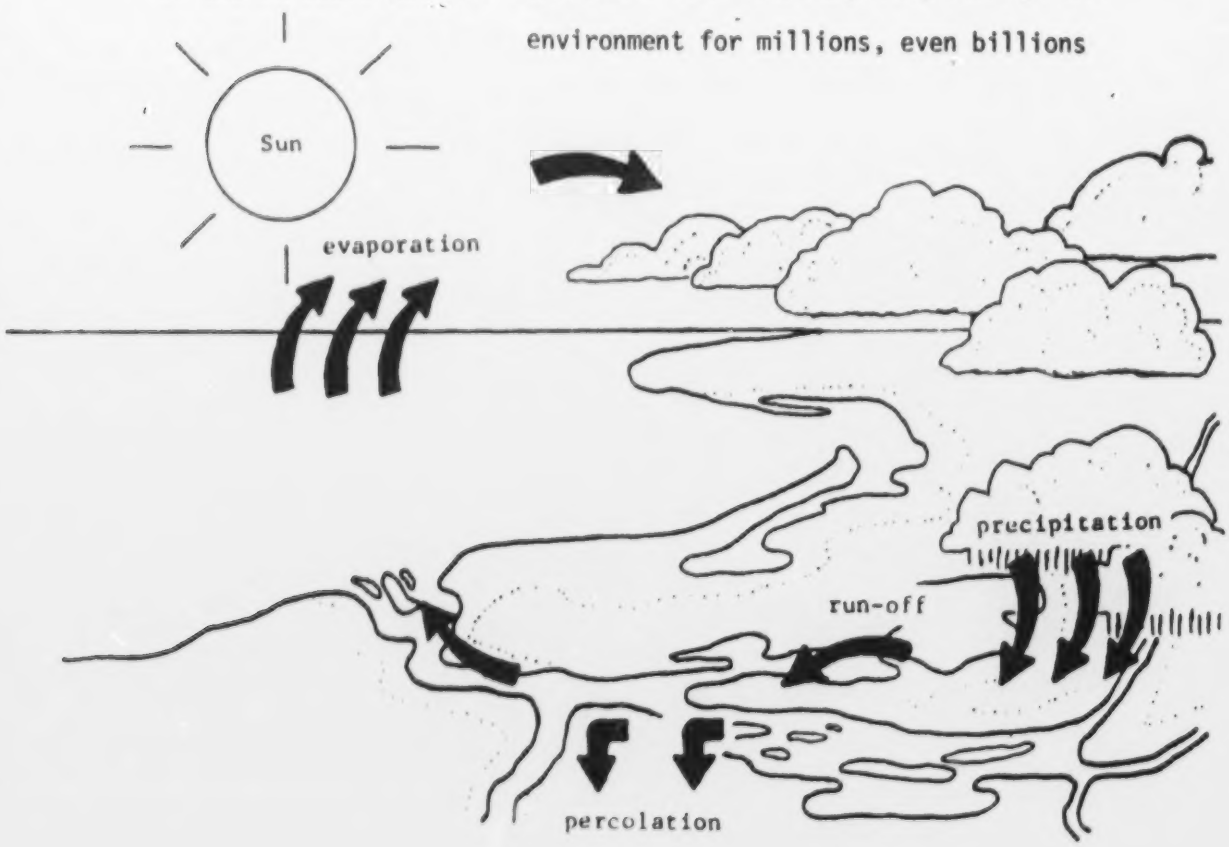
Teaching & Learning... information

Section 2

The activities in this section should focus on what the student needs to know in order to understand the concepts in the unit. The student should acquire information from the teacher, films, supplemental readings, the library, or experts, etc. in order to develop a foundation of knowledge basic to understanding the instructional concepts.

THE WATER CYCLE

The amount of water on the face of the earth has not changed appreciably since the beginning of time. The water that we drink today may be the same water that composed the bodies of the dinosaurs of the Jurassic period. This water has been recycling through the environment for millions, even billions



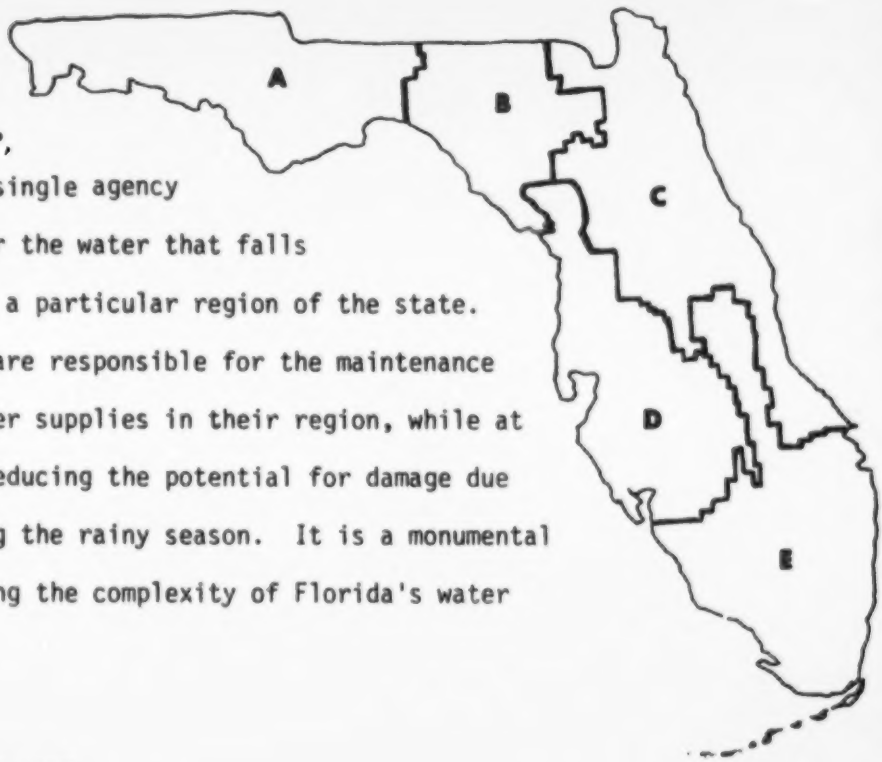
of years. Driven by the sun, a powerful system is constantly evaporating water from the surface and redepositing it back to the surface in some other place. In South Florida during the rainy summer months, the process can be seen quite clearly.

Fresh water evaporates from the surface of the Atlantic Ocean and the Gulf of Mexico (the salt does not evaporate). Water also evaporates from lakes, ponds, and the wet Everglades region in South Florida. It is carried into the atmosphere in rising warm air currents. As this vapor accumulates in the air, it is caught up by wind blown dust particles and is carried high over the land by winds in the upper atmosphere. Here, where the air is cooler, the vapor condenses into a visible form - called clouds. As the amount of moisture in the air continues to increase, these small droplets get larger until they can no longer be borne by the rising air currents. Gravity then causes them to fall back to earth as rain or, if it is cold enough, snow. From here the water may percolate down into the soil, evaporate back into the air, or run-off into progressively larger streams on its way back to the sea.

FLORIDA'S UNIQUE WATER PROBLEMS

If one puts a finger on a globe of the earth at the latitude of Florida, and rotates the globe, making note of all of the other areas in the world at the same latitude as Florida, one can gain an appreciation for the uniqueness of Florida's climate. The path that is traced intersects many of the great deserts of the world - the Sahara, Arabian, Iranian, Indian, Mojave, Sonoran, and Chihuahuan. Why then is Florida not a desert? To some extent, the answer lies in its proximity to large bodies of water, the Atlantic Ocean and the Gulf of Mexico. These two vast oceans help to modify our climate. This region actually receives a good deal of rainfall each year, enough that, at first look, water shortages and droughts should not pose a threat to the area. But the real problem is in the way in which the water is received. Rainfall is very seasonal, with over 75 percent occurring between May and October. Consequently, we are faced with alternating flood and drought conditions.

The Water Resources Act of 1972 established five Regional Water Management Districts on a watershed basis, meaning that a single agency has control over the water that falls and collects in a particular region of the state. These agencies are responsible for the maintenance of adequate water supplies in their region, while at the same time reducing the potential for damage due to floods during the rainy season. It is a monumental task, considering the complexity of Florida's water systems.

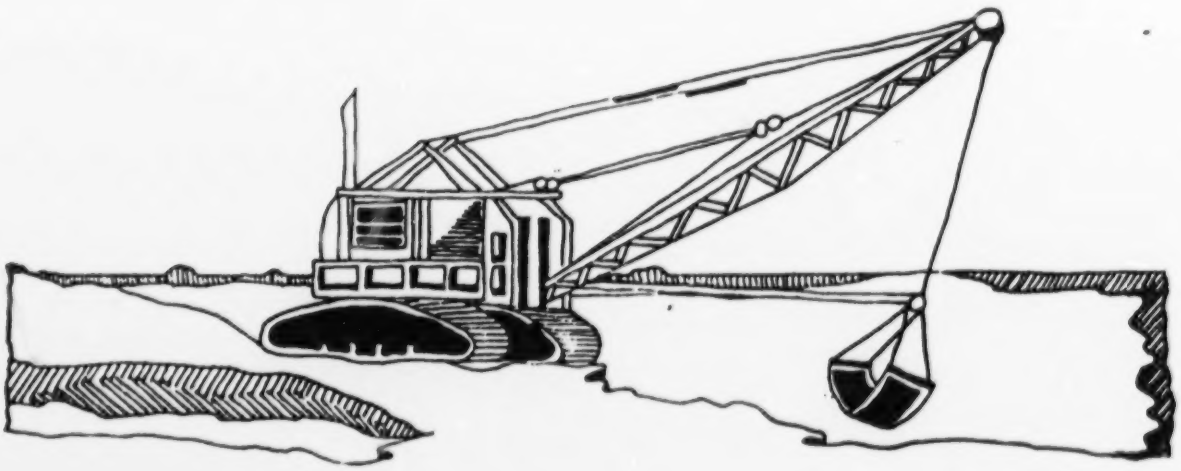


CHANGING LAND USE

When Florida joined the Union in 1845, one of the first acts of the new legislature was to commission a survey of the vast Everglades region to determine its potential for conversion to agricultural land. South Florida, being extremely flat and having ample water supply and fertile soils, seemed to be ideal for growing a variety of crops. One obstacle stood in the way. Over much of the year, the area was flooded by the overflow of Lake Okeechobee, making farming impossible. In 1881, the first drainage projects began in an effort to remove this water and divert it to the Atlantic Ocean. The alteration of this pattern of lush vegetative growth and flooding significantly

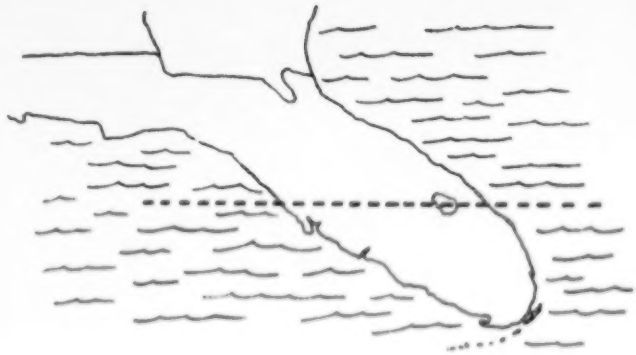
changed the deposition of organic matter into the soil. As expected, large areas of the Everglades dried up. This made the region susceptible to wildfires. The rich organic peat soils, now exposed to the air, began oxidizing and blowing away. With the removal of the natural vegetation and the annual sheet flow of water, this soil is no longer being replaced. Estimates put the annual loss of soil in these regions at more than one inch per year. At this rate, it is predicted that the soil will be too shallow for agricultural use by the 1990s.

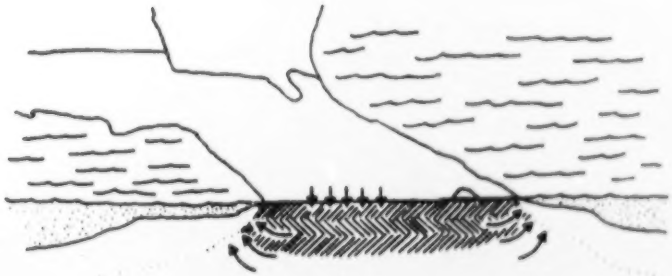
Without this annual overflow across the Everglades, the aquifers beneath the surface were not being recharged as they had been and, for the first time, people began to worry about the possibility of this underground water supply being contaminated or depleted.



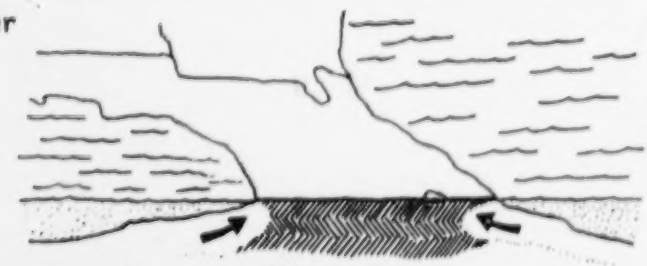
AQUIFERS AND SALT INTRUSION

An aquifer is an underground formation of porous rock, generally layered limestone in Florida, that is capable of receiving and retaining large amounts of water. Rainwater falling on the surface seeps down into the soil and accumulates in the storage areas. It is brought back up to the surface by the installation of wells. These wells may service individual households or they may be designed to supply entire communities with water. As long as there was an adequate flow of fresh water through the vast expanse of Everglades grasslands, this water could exert enough ground-water pressure to prevent the salt water from seeping in under the coastlines.





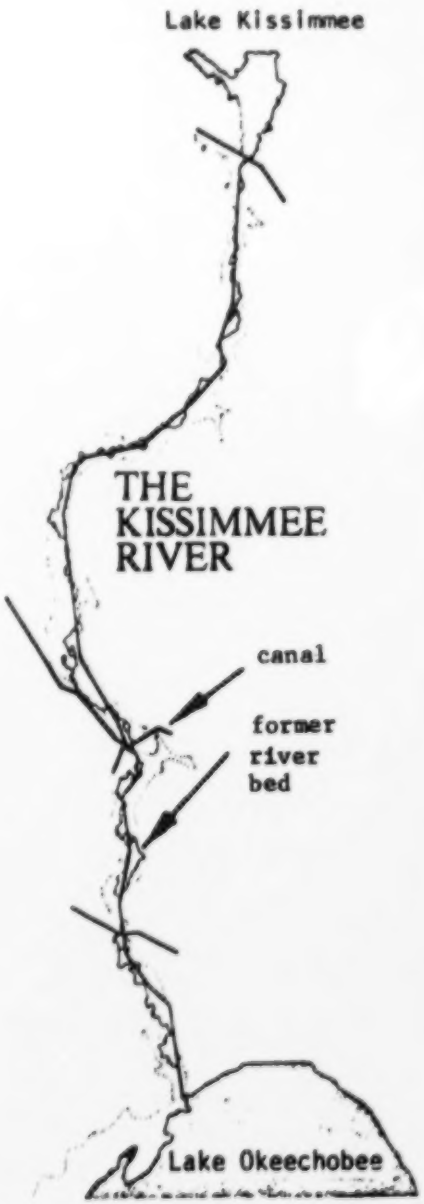
Now, with this sheet-flow of fresh water being restricted and diverted into canals, the ground water pressure is reduced, allowing the salt water to seep farther inland. As more and more water is pumped up from



these aquifers to serve a growing population, the problem of salt water intrusion into the aquifer becomes greater and greater. This problem is particularly evident along the lower east and west coasts of Florida where most of the growth in the last few years has occurred.

CHANNELIZATION - A SECOND LOOK

In the mid-1960s, the slowly meandering 100-mile Kissimmee River, which flowed south from Lake Kissimmee to Lake Okeechobee, was transformed into a 50-mile straight-cut canal at a cost of 30 million dollars. In 1976, the Florida Legislature adopted the Kissimmee River Restoration Act, which may replace up to 70 million cubic yards of earth removed when engineers changed the winding river into a 30 foot wide by 3 foot deep canal. It is generally agreed now that the channelization of the river led to an increase in the rate of eutrophication of Lake Okeechobee. Eutrophication is a natural aging process in lakes where nutrients enter from surrounding uplands and streams, supporting a slowly evolving system of plants and animals. This process is accelerated when more nutrients than the lake can naturally



use are channeled into it from upland fertilizers, sewage, and other pollutants. This heavy flow of nutrients into the lake often results in massive algal blooms. These mats of algae reduce the amount of sunlight that can penetrate into the water, killing many species of oxygen-producing water plants. As the algae mats die and decompose, the oxygen level is further depleted. As a result of this, game fish and commercially valuable fish are replaced by "trash" or non-salable, forage fish. The water often develops an unpleasant taste and a distinct odor.

When the canal was constructed, the floodplains of the original Kissimmee River were converted from marshlands to vast expanses of agricultural fields and pastures. Runoff from these areas carried fertilizer and cattle manure into the canal, and eventually into the lake.

Along with the underground aquifers, Lake Okeechobee is the heart of South Florida's water supply system. Major arteries are the primary canals connecting the lake with the three Everglades water conservation areas, which transport water to southeast Florida cities for purification and distribution. The quality and quantity of Lake Okeechobee's water are crucial to the people dependent upon this resource.

Hydrologic Cycle in South Florida

Major Water Control Structures in South Florida.

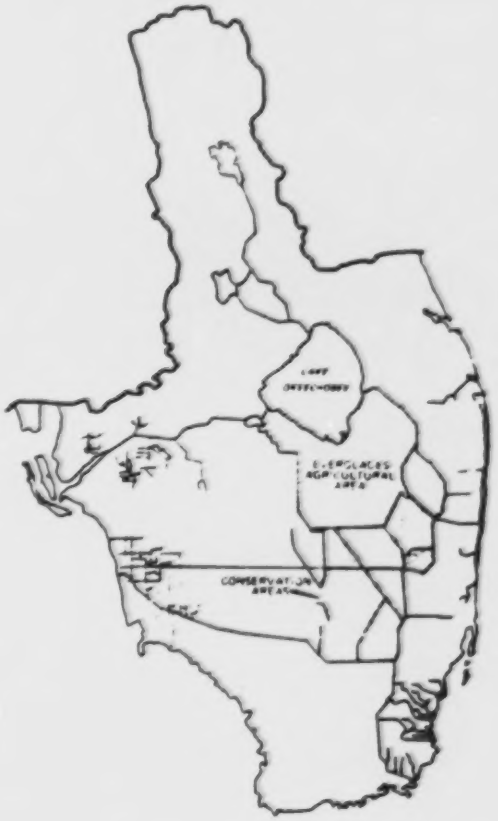
(a) Constructed before 1900

PURPOSE:
Navigation Drainage

(b) Constructed between 1900 and 1953

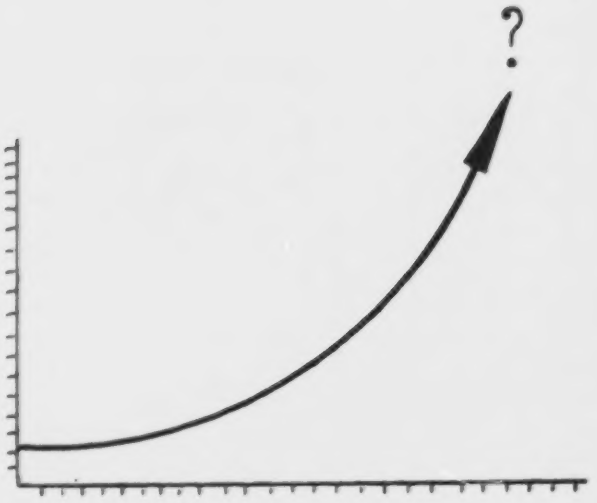
PURPOSE:
Drainage

(c) Constructed between 1953 and 1973



PURPOSE:
Flood Control, Water Supply, Drainage

POPULATION GROWTH



Water is of extreme importance to the future of Florida. It is needed for drinking, cooking, and cleaning, for agriculture and industry, for fisheries, and for the tourist trade that accounts for much of Florida's income. The amount of fresh water in Florida remains relatively unchanged while our population growth rate, the highest in the country, adds hundreds of thousands of new residents each year. From 1950 to 1980 the entire population of the U.S. grew by 45 percent, while Florida's population more than tripled. Of the 25 fastest growing metropolitan areas in the nation in 1982, ten were in Florida. Fort Myers was at the top of the list.[1] What does this tremendous growth mean in the face of a limited water supply? Obviously, choices will have to be made regarding the distribution of this precious resource. New technologies will have to be developed to enable us to cope with this seemingly unlimited demand. Compromises will have to be agreed upon and enforced. Most importantly, city and regional planning boards will have to make careful consideration of the impact that unrestricted growth is having, and will continue to have on the quality of life.

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1. Panorama of Florida. David A. Bice. Jalamap Publication, Inc. Charleston, West Virginia. 1982.

6-MILE CYPRESS

In central Lee County there exists a cypress strand that serves as the drainage route for a watershed of approximately 55 square miles. It serves many of the same purposes and is experiencing many of the same problems as the Kissimmee/Okeechobee/Everglades system does. This strand is called 6-Mile Cypress Swamp because it is located six miles from downtown Fort Myers. It consists of a slow moving central channel, about eight miles long, a number of open ponds, and adjacent transitional areas subjected to overflow during the wet season of June to November. The actual cypress strand rarely exceeds three-quarters of a mile in width as it follows the meandering path of water flowing through its main channel.

The strand is located approximately two miles east of Lee County Page Field Airport, running from Highway 82 southwesterly to where it flows into 10-Mile Canal bridge. From there the water flows out through 10-Mile Canal, into Mullock Creek, and finally into the mouth of Hendry Creek and the estuaries of Estero Bay.

SIX MILE CYPRESS WATERSHED BASIN

The construction of Highway I-75 and the new Southwest Florida Regional Airport in the 6-Mile watershed has stimulated a great deal of pressure to develop real

estate in the basin. Old agricultural lands are being bought up, drained and filled, and converted into residential and commercial properties. This encroachment has threatened the 55 square mile watershed and future county water supplies, and is beginning to threaten the strand itself.

Watersheds of Lee County as Outlined by the U.S. Soil Conservation Service (U.S. Dept. of Agriculture, 1973). Arrows Were Added to Indicate Patterns of General Surface Water Drainage.

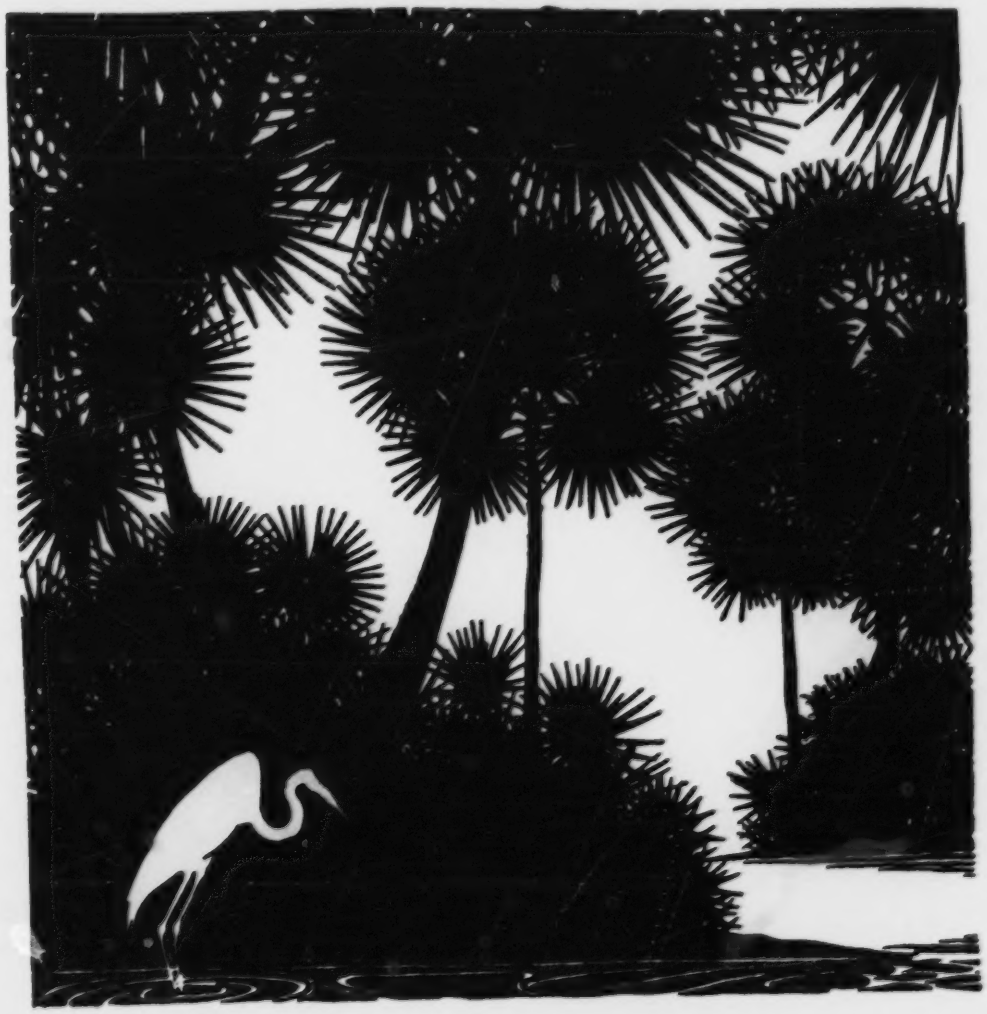
Over the years the 6-Mile Cypress watershed has been shrinking and changing as a result of human actions. Attempts have been made to reduce the amount of water in the strand, diverting it into 10-Mile Canal, or farther south in the watershed, thereby opening up more land for development and greatly affecting the passage of freshwater to Hendry Creek and Estero Bay.

The diversion of this water from the historic sheet-flow and meandering channel into straight-cut canals and drainage ditches is having significant effects upon the estuaries of Estero Bay, much the same as the cutting of the Kissimmee canal affected Lake Okeechobee.

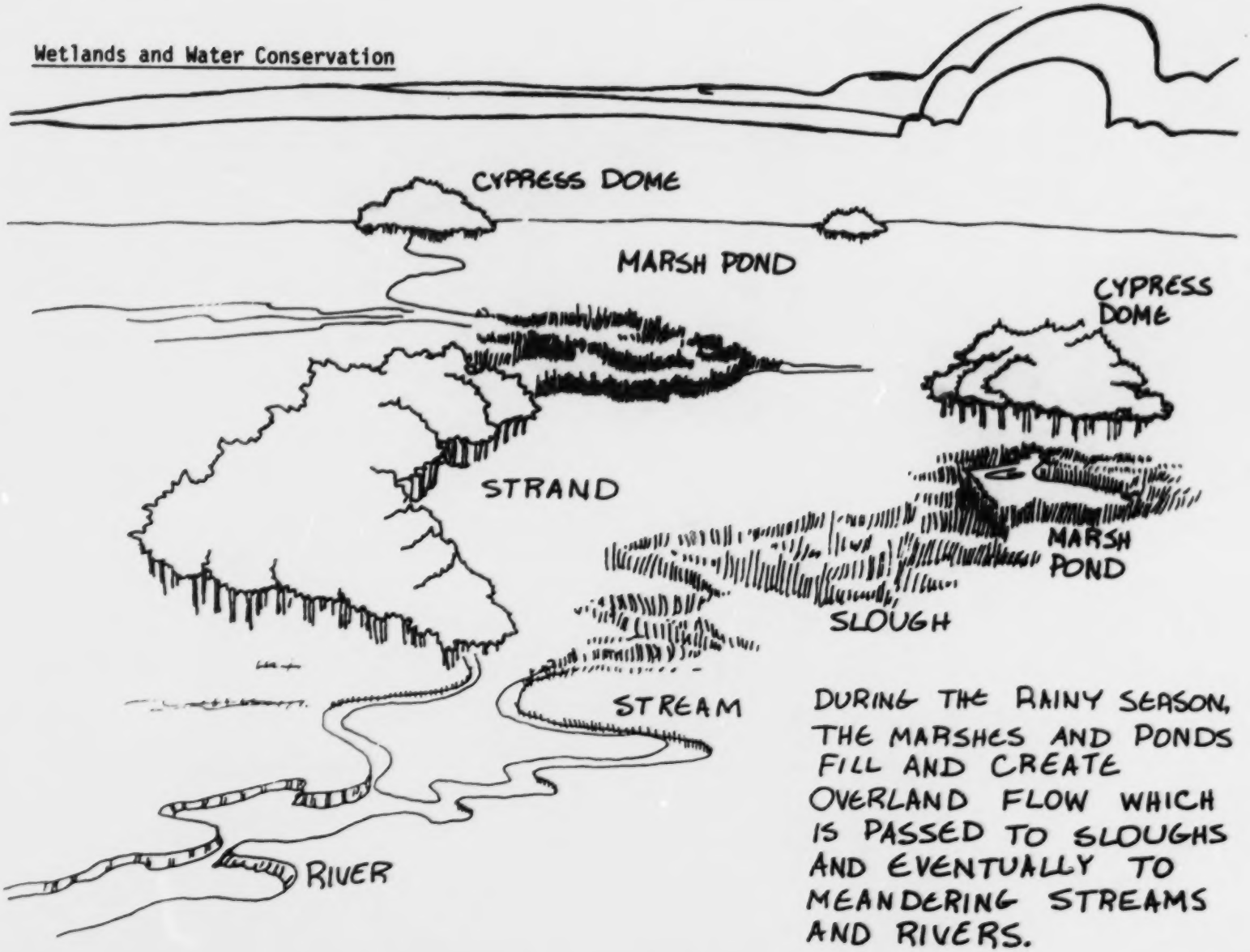
The natural flow of runoff ("surface") waters through the cypress strand enables the water to be cleansed of many of the pollutants and nutrients that it picks up as it washes from farm fields, parking lots, and roads. Many of these materials are taken up by the vegetation

growing in and around the swamp. As a result, the water that enters Estero Bay from the 6-Mile Cypress strand may be significantly cleaner than when it first entered the swamp.

The slow movement of water in the strand also enables the water to percolate down into the ground to recharge the aquifer. This underground water retention area will become even more critical as Lee County relies more and more on this aquifer to supply water to an increasing population.



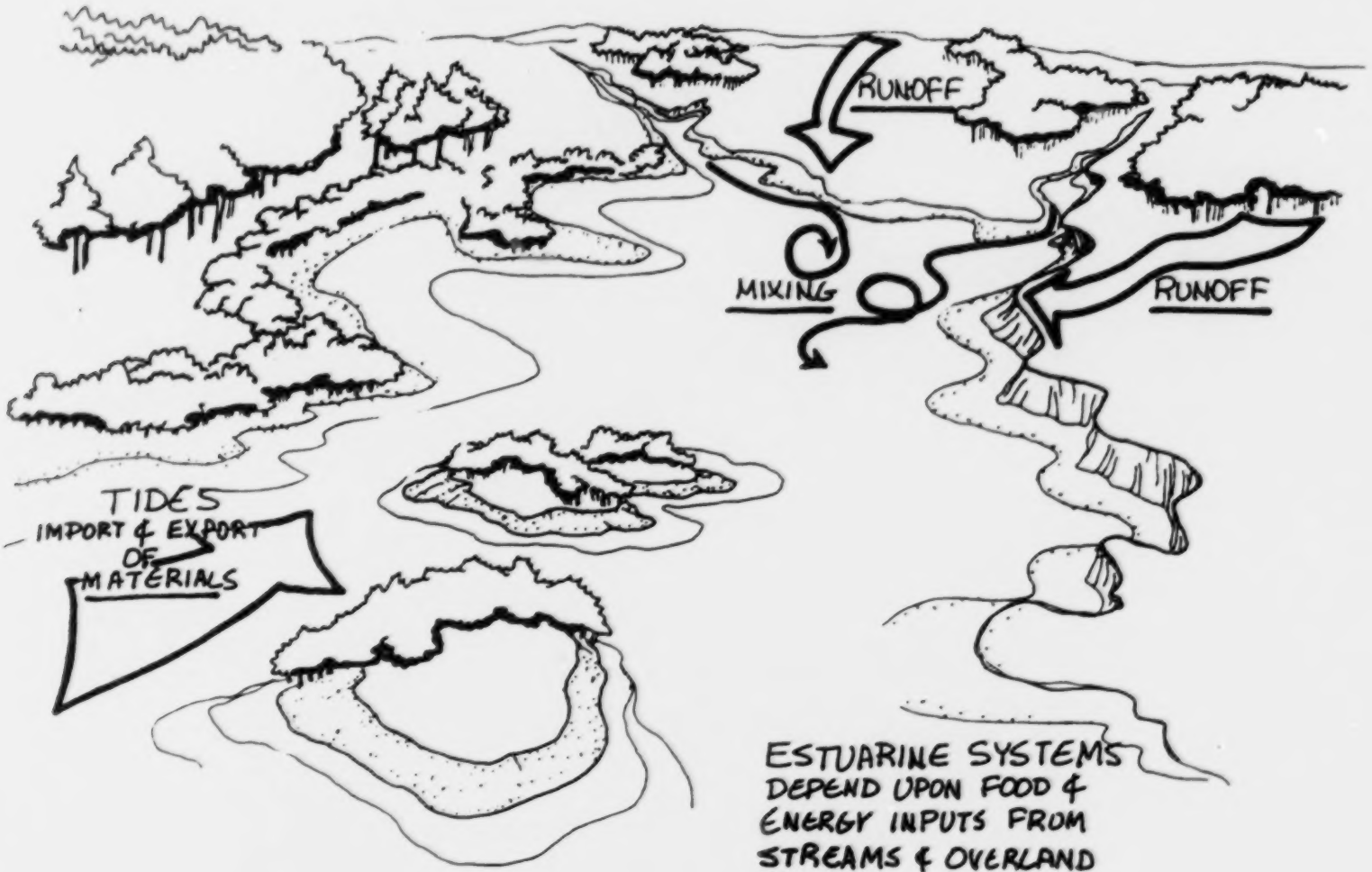
Wetlands and Water Conservation



32

DURING THE RAINY SEASON, THE MARSHES AND PONDS FILL AND CREATE OVERLAND FLOW WHICH IS PASSED TO SLOUGHS AND EVENTUALLY TO MEANDERING STREAMS AND RIVERS.

33

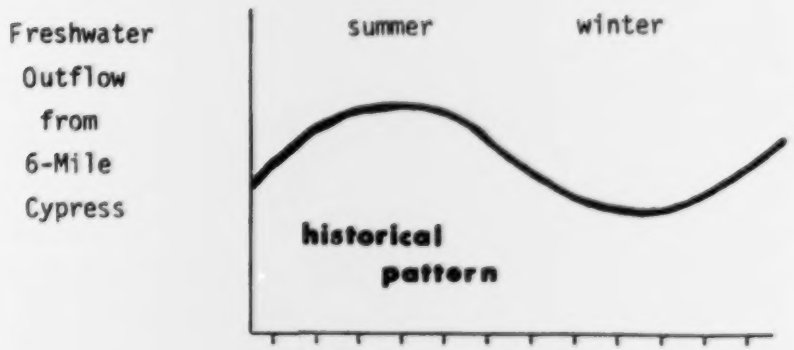


Estuarine Ecosystems Depend on Flows of Freshwater

10-MILE CANAL AND THE "YO-YO" EFFECT

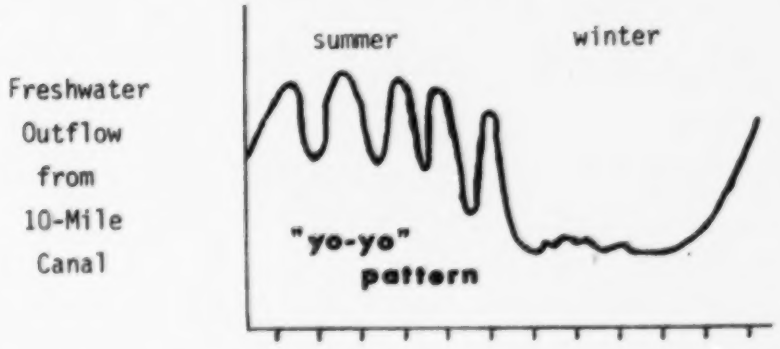
The water flowing out of the 6-Mile watershed eventually finds its way into the estuaries of Estero Bay. Historically, the meandering channel of the cypress strand and the wide swamp overflow areas have been able to "buffer" the effects of heavy rains and maintain a relatively stable flow of freshwater into the estuary. Water collected in the basin during three or four rainy months is slowly discharged into Estero Bay over six or seven months of the year.

This freshwater outflow mixes with the saltwater of the bay, producing brackish conditions in the estuary. During the summer months, the flow is heavier than during the very dry winter months, but on a day-to-day basis, the amount of water flowing into the bay is fairly constant.



With the construction of 10-Mile Canal, much of the surface water that had been passing through 6-Mile and Hendry Creek now flows down the canal and directly into the bay. By eliminating these meandering courses and restricting the water to a narrow canal, several days of heavy rain result in a "flush" of freshwater into the estuary. This

lowers the salinity of the water in the estuary. A dry period allows the saltwater to come back into the bay, raising the salinity of the water.

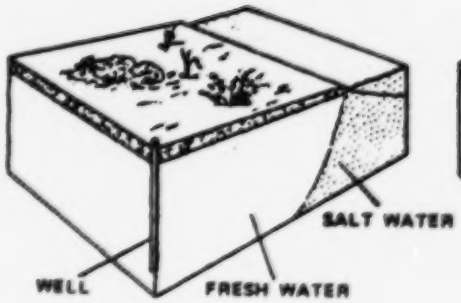


The resulting fluctuation between high and low salinty makes the estuary an unsuitable breeding ground for many species.

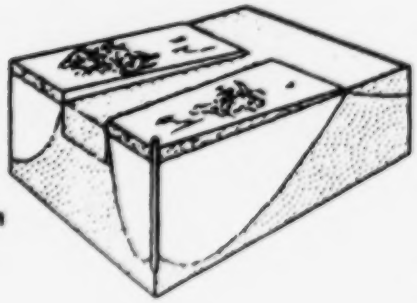
The estuary is a critical breeding and nursery ground for much of southwest Florida's sport and commercial fishing industries. Blue crab, snook, oyster, shrimp, and many other species rely upon this estuarine system for survival. The disturbance of the salinity has produced a marked decrease in the commercial and sport harvest of these species.

In an attempt to make the 10-Mile Canal function more like the swamp, a number of water control devices with flood gates, called weirs, have been installed in the canal. These partial dams restrict the flow of water, enabling some of it to percolate into the ground and recharge the aquifer. The weirs also help reduce the "yo-yo" effect in the estuary by providing a more uniform flow of freshwater into the bay. Unfortunately, the placement of these barriers has prevented some species from reaching inland freshwater marshes during their juvenile stages.

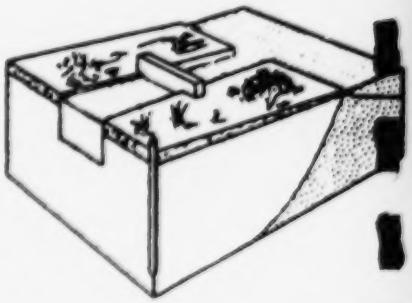
Effect of Uncontrolled Canals and Canal Control Structures on Fresh Groundwater Supplies



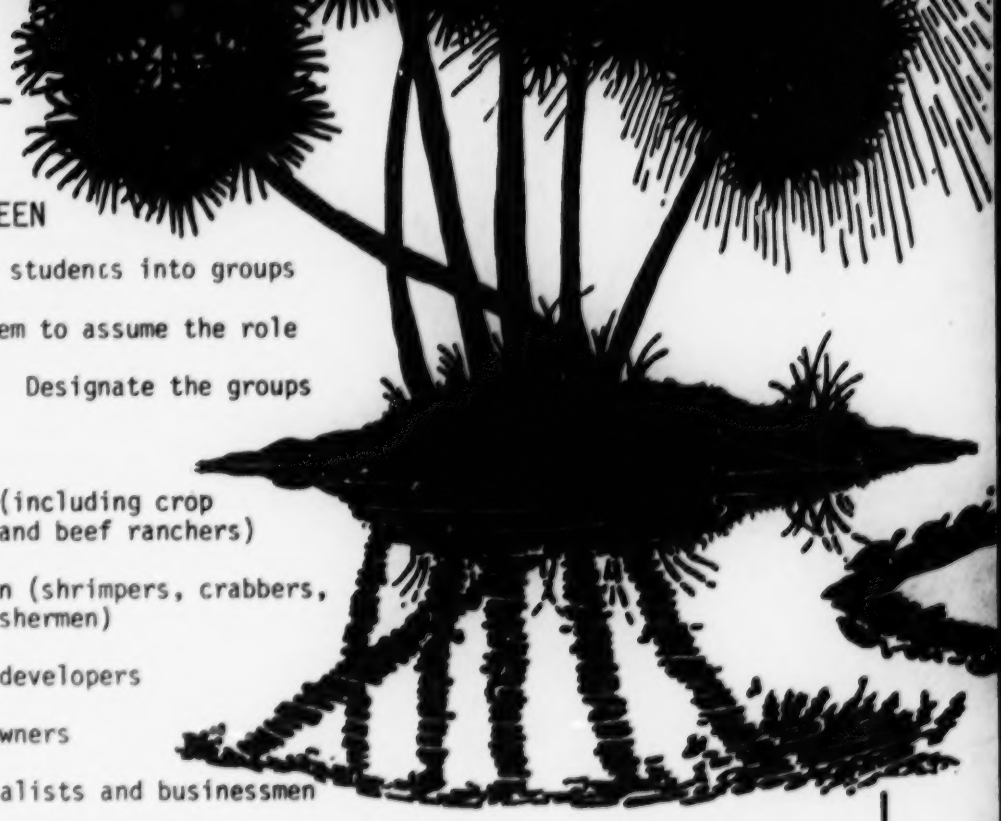
The freshwater - saltwater interface was nearly stable before coastal canals were built.



An uncontrolled canal that extends into an area of heavy pumping can convey saltwater inland to contaminate freshwater supplies.



In contrast, a controlled canal can provide a constant supply of freshwater to prevent saltwater intrusion and to recharge a well field by bringing in freshwater from upland areas.



CHOICES BETWEEN

Divide the students into groups and instruct them to assume the role of their group. Designate the groups as follows:

..farmers (including crop farmers and beef ranchers)

..fishermen (shrimpers, crabbers, sport fishermen)

..housing developers

..marina owners

..industrialists and businessmen

..hotel and restaurant owners (relying upon the tourist trade)

..tourists

..blue crab

..snook

..oyster

..shrimp

..deer

A group of students should also be selected to serve as County Commissioners.

Instruct the students to research the real roles and positions of their particular "special interest group." Ask them to relate their research to the problems of water resources in our area. They should collect newspaper clippings, watch television reports, conduct interviews, and otherwise collect information to support their own cases. This information and the field trip experience will be used in a mock County Commission meeting which occurs later in the unit.

Trying It Out ... field trip

Section 3

The activities in this section establish the required information procedures, rules, and student work assignments for the community study field trip. The primary purpose of this section includes firsthand field trip experiences and activities for students to try out in a real world situation the information they have acquired.

FIELD EXPERIENCE ORIENTATION

The purpose of the field experience in this study unit is two-fold.

First, the trip will give the students a first-hand exposure to an important local water system, 6-Mile Cypress Swamp. This swamp is one of the last remaining cypress complexes in Lee County. The "swamp" has often been thought of as a dangerous and uncomfortable place - one that is best avoided. The thought of snakes, alligators, and mosquitoes is generally enough to keep all but the most devout birdwatchers and "slough sloggers" at bay. It is hoped that this experience in 6-Mile will help to dispel some of the false notions of the "swamp." Students will be given the opportunity to walk

through areas that few people have ever seen, and to express feelings and thoughts with each other in an informal atmosphere.

The students will also have the chance to observe some of the water control devices designed to conserve and protect this valuable resource. They will see the weirs that have been installed in both the 6-Mile Cypress strand and the 10-Mile Canal. There will be ample time for discussion of the concepts in the unit, and the problems that the 6-Mile Watershed Basin is experiencing due to increased pressure from development.

The trip is intended to be a positive experience, one that will enable the students to make future decisions regarding water management, community development, and wildlife protection on the basis of some personal experience, and not solely on political rhetoric.

Depending upon the time of year and the amount of rainfall there has been, the water level may fluctuate greatly within the swamp (with water levels ranging anywhere from one foot to four feet in depth.) Students should be prepared to get wet during the walk through the swamp.

FIELD TRIP LEADERSHIP RESPONSIBILITIES

The EE/IDS field leader will:

1. select a safe and appropriate field study site;
2. provide transportation;
3. provide a cooler for lunches;
4. establish and explain rules of behavior;
5. review main concepts of the study unit;
6. orient students to 6-Mile Cypress Watershed Basin;
7. lead walk through swamp;
8. conduct various activities while in swamp;
9. assist with lunch distribution and group management.

The classroom teacher will:

1. prepare students for field experience through implementation of pre-trip materials;
2. orient students to purpose of field trip as described in study unit;
3. secure parent permission slips;
4. arrange for lunches and ice;
5. arrange for chaperons (optional);
6. ensure that all students are properly clothed; (tie-on shoes are mandatory; plan on getting wet to the chest);
7. request students to use the restrooms before leaving school; there are NO facilities available during the trip;
8. help field leader with review of main concepts;
9. help field leader maintain appropriate behavior on the bus and during the day;
10. coordinate distribution of lunches;
11. implement post-trip activities included in the unit.

CHOICES BETWEEN

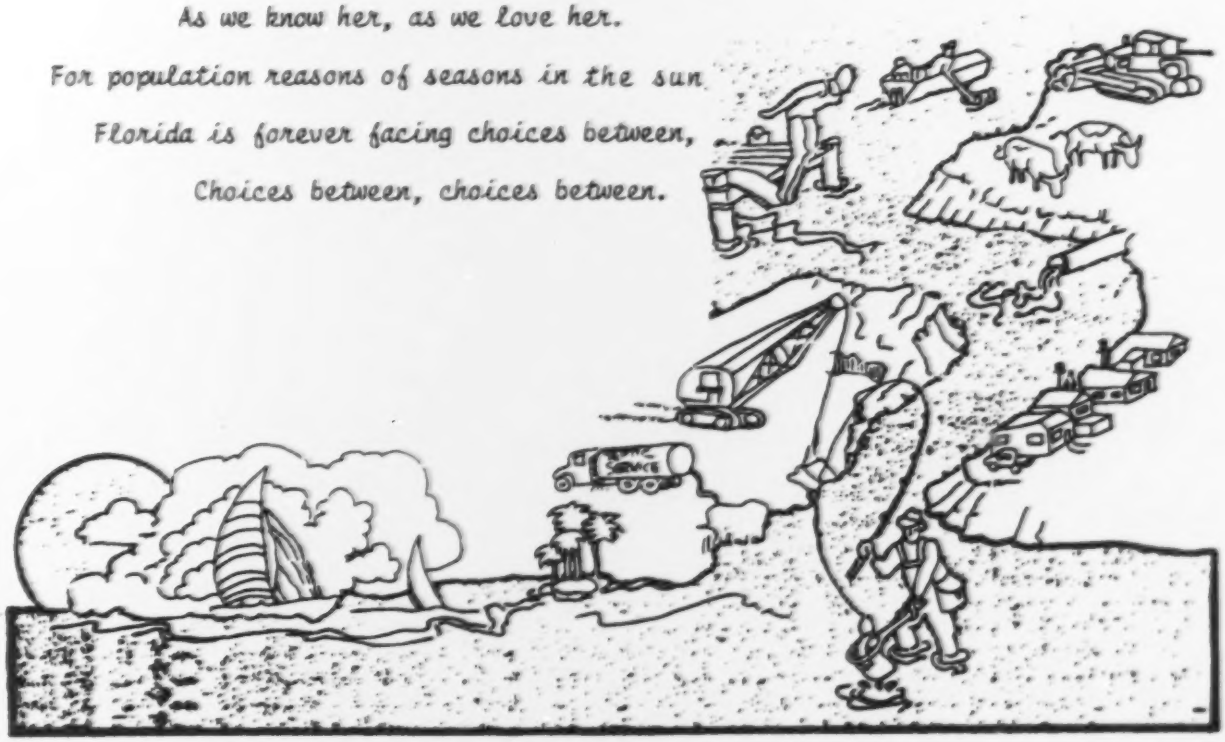
by Ken Woodburn and Dale Crider

For population reasons of seasons in the sun
Florida is forever facing choices between...

Creeks or Canals
Marshes or Marinas
Water or Waste
Beaches or Barriers
Sunshine or Smog
Men or Machines
Greenlands or Ghettos
Pavement or Palmettos.

And how we make these choices for the uses of the land
Will surely etch the future of Florida in the sand
But the most important thing of all is that we save our State
As we know her, as we love her.

For population reasons of seasons in the sun
Florida is forever facing choices between,
Choices between, choices between.



Self Teaching & Extending

Section4

The activities in this section should encourage students to self discover "new connections" that integrate their experiences with new applications related to the instructional concepts. Students are encouraged to teach others what they know, or to create new ways of expressing or applying what they have learned.

1. "CHOICES BETWEEN"

As an introduction to the final set of activities in this unit, distribute copies of the poem *"Choices Between"* to each of the students and have them read along as one student reads aloud. A cassette recording of this song is also available from the Department of Environmental Education and Instructional Development Services. Have the students discuss their reactions to the poem.

2. MOCK COMMISSION MEETING

The County Commission simulation is designed to give the students a chance to investigate opposing uses for water, and to discover how various groups relate to water in South Florida. Briefly discuss the role of an actual County Commission. The students should know that

this group is responsible for much of the planning that occurs in the community. What the students will be doing during this simulation is very similar to the way the actual County Commission works.

Have the "special interest groups" complete their research into the problems and needs of their group. Ask them to specifically relate their problems and needs to the 6-Mile Watershed Basin. Instruct them to prepare a brief presentation for the "County Commissioners." During the presentations the Commissioners will be listening to these groups in an effort to develop legislative guielines that will ensure adequate future supplies for <u>all</u> residents and visitors in Florida. After the presentations, the Commissioners should have time to question the members of the special interest groups. When this has been completed the Commissioners should formulate guidelines with input from the rest of the class.

Have the Commissioners and the class consider such questions as:

- Who "owns" the water that falls on private land...public land?
- Can we rely on new technologies (desalination, tertiary

sewage treatment, solar distillation) to assure adequate water supplies in the future?

- What can people of South Florida do to live under "drought and drown" conditions?
- What are the long range consequences of the guidelines we develop today?
- Should individuals and corporations be held responsible for the contamination of water resources on their property?

It is important that the students realize that it is impossible to satisfy everyone's desires and that compromises must be made. The overall "good of the community" should be the deciding factor. Attention should be paid to the income sources, recreational uses, and water needs of the community.

TIPS ON SAVING WATER

	Normal Use	Conservation Use
Shower	Water running 25 gallons	Wet down, soap up, rinse off 4 gallons
Brushing teeth	Tap running 10 gallons	Wet brush, rinse briefly 1/2 gallon
Tub Bath	Full 36 gallons	Minimal water level 10-12 gallons
Shaving	Tap running 20 gallons	Fill basin 1 gallon
Dishwashing	Tap running 30 gallons	Wash and rinse in dishpans or sink 5 gallons
Automatic Dishwasher	Full cycle 16 gallons	Short cycle 7 gallons
Washing Hands	Tap running 2 gallons	Fill basin 1 gallon
Toilet Flushing	Depending on tank size 5 to 7 gallons	Alternate flushing or use displacement bottles 2 to 5 gallons
Washing Machine	Full cycle, top water level 60 gallons	Short cycle, minimal water 27 gallons
Outdoor Watering	Average hose 10 gallons per minute	Recycled water

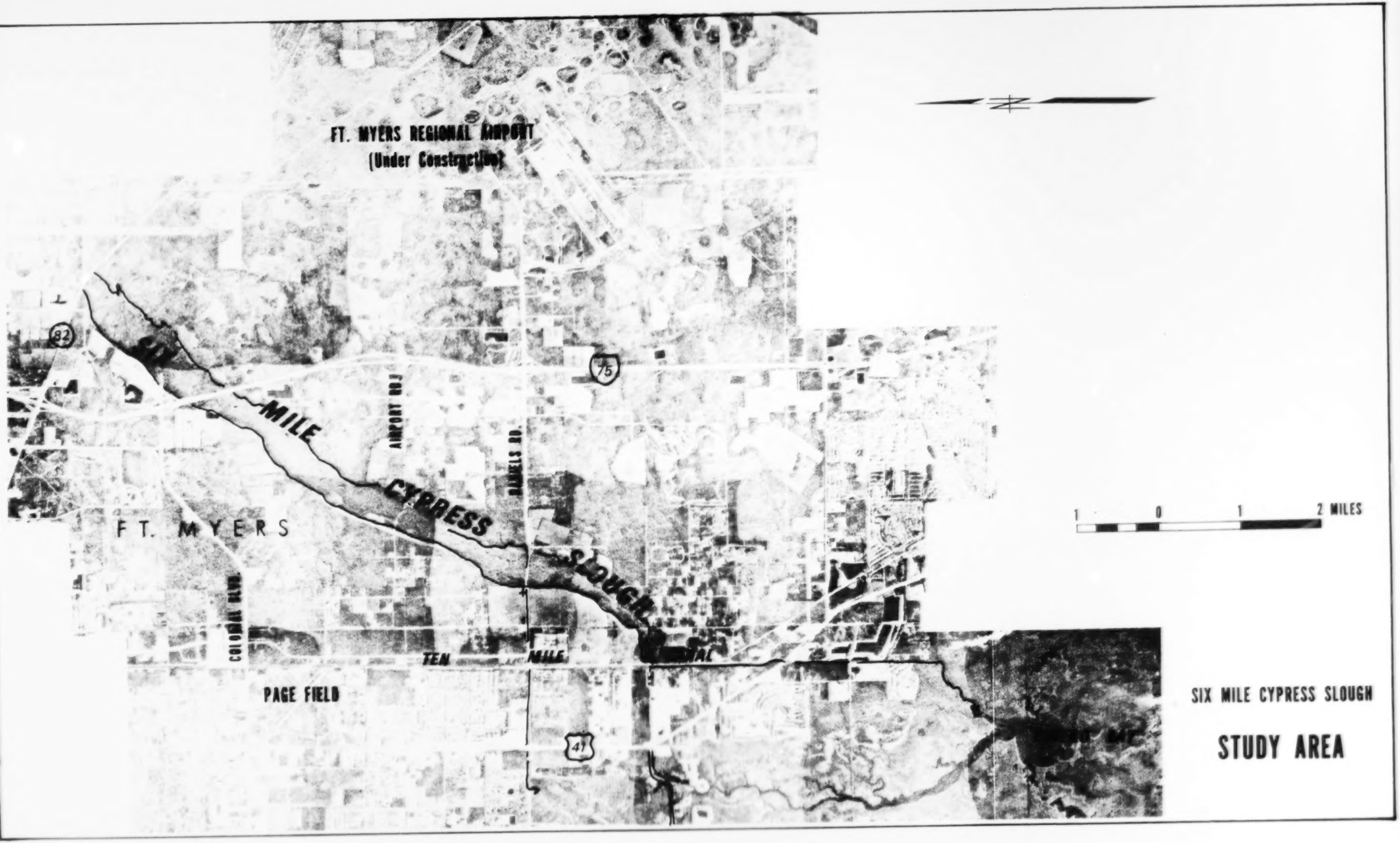
3. Personal water consumption - In groups, have the students list the many ways they themselves use water in their daily lives. Ask them to try to estimate the amount of water they use each day. Be sure they think about the water that is used to prepare other foods we eat or drink. How much would they be willing to pay for this water? Remind them that without it, they would not live very long. Have them search for ways they might cut their water consumption.

4. Give POST-TEST to students (pages 49 - 52).

OPTIONAL

5. Show the film: Problems in Conservation - Water -- 12.395. While this film deals with water conservation problems in the S.W. section of the United States, it does show quite clearly some of the same problems that we are experiencing here in Florida. The film also demonstrates the process of desalination, a process for getting fresh drinking water from the sea, something that is being done right here in Lee County. A complete transcript of the narration is included with the film, as well

APPENDIX



SIX MILE CYPRESS SLOUGH

STUDY AREA

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The Complete 4MAT System Model

The Teacher's Role: A Recapitulation

The teacher's role changes as s/he moves through the cycle of learning:

- from Motivator/Witness
- to Teacher/Information Giver
- to Facilitator/Coach
- to Evaluator/Remediator and Resource.

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4MAT SYSTEM MODEL

FOR

"Choices Between"

STUDY UNIT

7TH GRADE - CHOICES BETWEEN - COGNITIVE PRE/POST TEST

Choose the one answer for each question that is most correct.

1. In South Florida, most of the rain comes
   a] in the winter.
   b] in the spring and the fall.
   c] in the summer and early fall.
   d] evenly throughout the year.

2. South Florida's seasonal rainfall pattern is
   a] similar to the rest of North America.
   b] unpredictable from year to year.
   c] even throughout the year.
   d] fairly unique in North America.

3. Before 1890, water from Lake Okeechobee would
   a] periodically overflow into the Everglades.
   b] flow directly into the Caloosahatchee.
   c] almost dry up each year.
   d] percolate into the aquifer with no surface flow.

4. The water cycle model includes
   a] evaporation, percolation, carburetion, sheet flow.
   b] percolation, hydrolization, precipitation, conservation.
   c] hydrolization, evaporation, sheet flow, percolation.
   d] precipitation, percolation, evaporation, condensation.

5. An estuary is
   a] a deep freshwater pond.
   b] an area of brackish water where a river meets the sea.
   c] a trench in the open ocean.
   d] a shallow part of the ocean far away from the mainland.

6. Water from the 6-Mile Cypress Strand flows into
   a] Estero Bay.
   b] Imperial River.
   c] Caloosahatchee River.
   d] San Carlos Bay.

7. A cypress strand
   a] flushes upland residential areas quickly.
   b] adds excessive nutrients to the water.
   c] slows down the movement of water.
   d] holds water like a cesspool.

8. The population growth rate of Fort Myers is
   a] dropping rapidly.
   b] about average in the United States.
   c] less than Houston, Los Angeles, and Miami.
   d] among the highest in the country.

9. Eutrophication is
   a] the process of cleaning a stream of impurities.
   b] the natural aging process in bodies of water.
   c] the destruction of a lake by draining its water.
   d] evapotranspiration from a body of water.

10. Water that is stored in an aquifer can be found
   a] underground.
   b] in Lake Okeechobee.
   c] in tanks at the purification plant.
   d] in cisterns on most old farms.

11. The topography of South Florida is
   a] quite varied.
   b] very flat.
   c] rolling.
   d] seasonal.

12. A weir is used to
   a] temporarily house orphan or injured birds.
   b] help control the flow of water.
   c] direct airflow across a watershed.
   d] all of the above.

13. The 6-Mile Cypress strand is an important area because
    a] it is habitat for endangered species.
    b] it cleans and stores fresh water.
    c] it is connected to an estuary.
    d] all of the above.

14. A watershed is
    a] an area of land which drains water to a common point.
    b] a drainage basin.
    c] in some ways like a kitchen sink.
    d] all of the above.

15. Saltwater intrusion occurs when
    a] more freshwater is taken out of an aquifer than soaks back in from above.
    b] too much fresh water is pumped into the aquifer.
    c] the reverse osmosis plant breaks down.
    d] cypress strands are preserved.

16. Sheet flow can occur
    a] only underground.
    b] in humid, mountainous regions.
    c] only in wet, flat areas.
    d] in the ocean.

17. Water is considered a finite resource because
    a] clean, usable water is limited.
    b] we need it to live.
    c] it is all polluted.
    d] it always flows downhill.

18. Percolation is the process of
    a] sheet flow.
    b] water seeping down into the soil and bedrock.
    c] surface run-off of excessive precipitation.
    d] water moving from the open ocean into the atmosphere.

19. Estuaries are important because

a] they are a major source of drinking water.

b] they provide water for the cypress strands.

c] electric power plants are usually built in them.

d] many types of aquatic life use it as a nursery.

20. 10-Mile Canal

a] is being changed to reduce the yo-yo effect.

b] flows into the Caloosahatchee.

c] drains Lehigh Acres.

d] was built to get boats into Estero Bay.

KEY TO

7TH GRADE - CHOICES BETWEEN - COGNITIVE PRE/POST TEST

1 - c
2 - d
3 - a
4 - d
5 - b
6 - a
7 - c
8 - d
9 - b
10 - a
11 - b
12 - b
13 - d
14 - a
15 - a
16 - c
17 - a
18 - b
19 - d
20 - a

GLOSSARY

algal bloom - a rapid growth of algae, small green plants, in water that has been enriched with nutrients.

aquifer - a natural underground water storage area.

biosphere - the part of the world where life exists; all of the living things on earth and the water, air, and soil.

channelization - the cutting and dredging of a river to limit its winding and flooding.

climate - the general weather conditions (rain, temperature, winds, humidity, etc.) that occur in a region.

community - the plants and animals that co-exist in a given area.

condensation - the process of water vapor molecules coming together and forming larger droplets of liquid water.

cycle - a recurrent sequence of events that has no beginning and no end.

desalination - the process of removing the salt from sea water to make fresh water for human consumption.

drainage basin - an area of land which drains water (from precipitation) to a common point, usually a river or stream; also termed watershed.

estuary - an area of brackish water where a river meets the sea; extremely important as a nursery for many types of aquatic life.

evaporation - the process of water molecules passing from the water surface into the air as a vapor.

indicator species - an organism, often a plant that identifies or tells something about a particular area. Cypress is an indicator species for freshwater swamps. Saw palmetto is an indicator species for pine flatwoods.

limited resource - something of which we have only a certain amount and can get no more.

peat - a soil type composed of partially decomposed plant material that has been deposited under water.

percolation - the process of water seeping down into the soil.

precipitation - water falling back to earth as a result of condensation of water vapor in the atmosphere.

run-off - the flow of water over the surface of the land during and after precipitation.

salt intrusion - the seepage of saltwater into freshwater aquifers.

sheet flow - the flow of shallow water over the surface of the land. The original water flow through the Everglades consisted of a "river," many miles wide and only a few inches to a foot deep. This is now being diverted into narrow, deep canals.

slough - an elongated swamp, often having a channel of slowly moving water; also called a strand.

strand - an elongated swamp, often having a channel of slowly moving water; also called a slough.

topography - the structure of the surface of the land.

watershed - an area of land which drains water (from precipitation) to a common point, usually a river or stream; also termed drainage basin.

water table - a measure of the level of water in the underground storage areas.

weather - the state of the atmosphere at a given time measured by temperature, precipitation, humidity, wind speed, air pressure, etc. The climate of an area describes the general weather patterns that occur throughout the year.

weir - a dam or other device for controlling water level and diverting its flow.

BOOKS AND WRITTEN PUBLICATIONS:

A Panorama of Florida — David A. Bice
Jalamap Publications, Inc. Charleston, W. Va. 1982.

The Watersong Book — Dale and Linda Crider
Anhinga Roost Music Co. Gainesville, FL 1981.

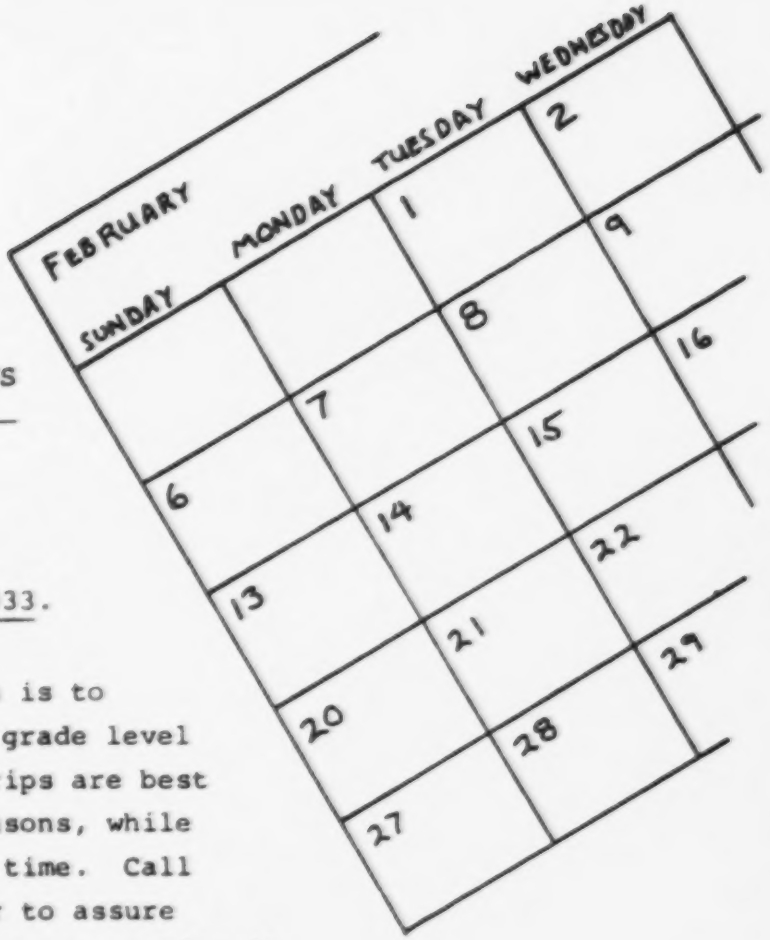
Our Nation's Wetlands - an interagency task force report.
U.S. Government Printing Office - stock number 041-011-00045-0.

FILMS:

	Cat. No.	Level
The Earth: Its Water Cycle	11.663	I, J
Ecology of the Swamp	11.573	I, J, S

MUSIC:

Watersongs — Dale and Linda Crider
Anhinga Roost Music Co. Gainesville, FL 1981.
Available from EE/IDS.



SCHEDULING CONSIDERATIONS

To arrange an EE/IDS community study trip, please call us at 275-3033.

Our first recommendation is to use one of the standard grade level trips. Some of these trips are best done during specific seasons, while others work well at any time. Call early in the school year to assure getting a trip, and to assure getting it at the most appropriate time.

If the standard trip does not meet your needs, a custom trip could be designed. This would necessitate a meeting with EE/IDS staff to identify goals, design pre- and post-trip activities, and create a meaningful field experience. Any custom trip should have at least the impact of the standard trips. It should also mesh closely with the on-going curriculum. The classroom teacher and EE/IDS staff would share development responsibilities.

→ CALL 275-3033 ←

PARENT PERMISSION FORM

As parent or legal guardian, I hereby grant permission for _____ (student's name) to take part in a field trip to 6-Mile Cypress Swamp on _____ (date). I understand that this trip is an integral part of the on-going school curriculum, and that the students will be studying the importance of the 6-Mile Cypress Watershed Basin. On the trip the students should expect to get wet at least to their waists. I'll be sure that my child wears clothes that can get wet, and tie-on shoes.

_____
(Parent or Guardian signature)

_____
(date)

_____
(emergency phone number)

This publication is one of the teaching units in the community studies series developed by the Lee County Schools, Florida.

The community study series is designed to assist teachers and students in learning through experience how the Lee County communities function, and the rights and responsibilities each of us shares in maintaining a healthy, productive community.

By systematically experiencing our community, students tend to see the pattern that connects the natural and cultural environment, and how each of us is an independent agent for change.

The community study instructional units have been field tested by teachers and students.

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The units have been produced by the staff of THE DEPARTMENT OF ENVIRONMENTAL EDUCATION AND INSTRUCTIONAL DEVELOPMENT SERVICES of Lee County School system:

Bill Hammond . . . . . .Director
Jo Ellen Kessler . . . . . Coordinator
Craig Hortman . . . . . .Resource Teacher
Rick Tully . . . . . .Resource Teacher
Keith Hanson . . . . . .Resource Teacher
Neil Wilkinson . . . . . .Resource Teacher
Cindy Bear . . . . . .Resource Teacher
Terry Lawson . . . . . Helping Teacher
Tom Miller . . . . . Helping Teacher
Lynette Dean . . . . Adv. County Staff Secretary
Cathy Scott . . . . . County Staff Secretary

with special contributions from former EE/IDS staff members, Lee County teachers, district staff, students, and members of the community.

Lee County Schools
Environmental Education/
Instructional Development Services
2055 Central Avenue
Fort Myers, Florida 33901
813-275-3033